2018 ITRC Project Proposal

Implementing the Use of Advanced Site Characterization Tools

Proposal Date

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Proposal Contacts

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Proposal Summary

A number of advanced site characterization tools, which greatly expand the ability to understand contaminant concentration and mass as well as increase the ability to understand the stratigraphy of the contaminated media (soil, rock) are available but underutilized. These advanced site characterization tools can be broadly classified into analytical tools and geophysical tools. Analytical tools may be represented by membrane interface probe (MIP), an older well-known technology, and ultraviolet optical screening tool (UVOST), also known as laser-induced fluorescence (LIF), a newer technology. Geophysical tools may, in turn, be divided into those that have a vertical focus and those that have a horizontal focus. Vertically focused tools may be represented by borehole sensing devices and borehole geophysical logging while horizontally focused tools may be represented by surface geophysical methods such as two-dimensional resistivity or micro-seismic techniques.

While some of these tools, as well as the core principles underlying newer variations of such tools, have been in existence for several years, advances in computing and supporting technologies have vastly improved data analysis, presentation, and user experience. Despite significant progress, these tools are commonly only applied at the largest, most complex sites, and often only after conventional investigation techniques have failed to adequately characterize a problem. This is surprising given that the amount of data collected per time

invested exceeds that provided by more traditional methods. Additionally, costs have fallen significantly while the number of companies offering these services (and their geographic range) has increased.

Given these factors, typified by the amount and quality of the data acquired versus the cost to obtain that data, a tipping point has been reached such that characterizing contaminated sites using conventional monitoring wells, discrete soil samples, and visually-described core logs are becoming obsolete. Sole dependence on these methods, because these methods are comparatively time-consuming, costly, and data quantity limited, typically results in significant data gaps relative to the effort expended. Despite the obvious advantages of the advanced site characterization tools, guidance on implementation and practical application is not readily available.

To support the general adoption of advanced site characterization tools, multiple barriers must be overcome. These barriers include the perception that the tools are not readily available, that they are too expensive, and that the data are perplexing or too subjective. Moreover, some environmental practitioners simply do not know how the tools work, that is, the basic principles underlying their function. Finally, many do not know how to select among the tools and integrate their use to meet characterization and remedy objectives. This proposal is for preparing guidance to overcome these barriers to adoption.

The goal of this project is to meld existing guidance, primary literature, vendor literature and personal experience, illustrated by projects from the states, into a practical guide on the selection and application of advanced site characterization tools. Presently, ITRC has a number of publications such as the DNAPL Tools Selection Workbook[1] the ITRC 2013 guidance for Environmental Molecular Diagnostics, Triad, Petroleum Vapor Intrusion, Fractured Bedrock (pending), and Remediation Management of Complex Sites (pending) that touch upon advanced site characterization tools. These documents are helpful and will be referenced as appropriate. However, no single document provides comprehensive, integrated guidance on selection and practical application of advanced site characterization tools.

This proposed project will develop that comprehensive, integrative document. The team will identify a group of complementary, advanced site characterization tools. We will address the selection, application, and integration of the tools into the project life-cycle of site characterization, remediation, monitoring, and closure. The guidance will provide practical explanations regarding the function and operation of each tool, that is, how it works and when to use it. Without focusing on more conventional subsurface characterization techniques, the guidance will illustrate both the advantages and disadvantages of the newer tools in the amount and quality of data collected per time, in relative costs, and in tool availability. We will address common misunderstandings and misapplications associated with individual, advanced

[1] The ITRC "Intergrated DNAPL Site Characterization and Tools Selection, May 2015" (the "DNAPL toolkit") printed and web-based guidance describes the applicability of these tools to DNAPL problems and lists key tools and their fundamentals.

characterization tools. In addition to evaluating individual techniques, we will discuss appropriate site characterization tool combinations. We will ensure that the guidance handles interpretation of the results and management of the data. We will address perceived regulatory barriers to the full use of these techniques. Finally, case studies will support the lessons in the guidance.

Approach: Industry, academia, federal, state and DoD personnel use these techniques. Expertise will be gathered to:

- Identify the most relevant advanced site characterization tools to include in this guidance, focusing on tools that are advanced into the subsurface via direct-push technology and surface and borehole geophysics;
- Link to the DNAPL/Site Characterization toolkit for the tools, their applicability, strengths, and limitations, as well as references and links to supporting documentation from the tools' developer and examples of real-world applications, as appropriate;
- Build on available information, like EPA's Course on Groundwater High-Resolution Site Characterization (HRSC), to show the advantages and utility of these tools.

The substantive, and new, part of the project is to develop guidance on practical implementation of the tools:

- Tool selection based on environmental and geologic conditions (e.g., checklists, flow-paths);
- Conceptual or basic knowledge needed to use a particular tool properly;
- How to interpret, review, and present the data;
- How to select the tools combinations to support the CMS development;
- Realistic expectations for daily progress and outcomes; and
- Examples and case studies of their use and applicability, as well as, potential pitfalls when used inappropriately.

Summary and Schedule of Deliverables (primary project product(s))

We anticipate that the team will develop web-based, interactive guidance leading to online and potentially classroom training.

This project is expected to take up to two years to prepare the relevant guidance and up to a further year to review and finalize the web-based guidance and prepare the web-based training

Proposed Team Composition

Representatives will be needed from state government, EPA, DoD, industry, and academia to provide a full perspective on the scope of advanced assessment tools. Guidance will be sought from specialist agencies, such as USGS.

State personnel from Connecticut, Colorado, Kentucky, Maine, Virginia, and Vermont have expressed an interest in this proposal. Staff from EPA have been supportive of the proposal and expressed a strong interest in participating in this group. Battelle has expressed interest. Several consultants, petroleum industry members, and specialist providers have indicated that the proposed guidance is timely and needed and that they would be interested in participating.
Ed Winner of Kentucky and Alex Wardle of Virginia have expressed interest in acting as team leaders.

Identification of Potential Funding Sources

Representatives from specialist providers, the consultancy community, and the oil retail industry have indicated interest in and potential financial support for the project.